

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: HOWLAND, Charles A.

Group Art Unit: 1771

Serial No.: 09/289,208

Examiner: GUARRIELLO, John J

Filed: April 09, 1999

Dkt No: W0490/7007

For: PROTECTIVE FABRIC HAVING HIGH PENETRATION RESISTANCE

To: Assistant Commissioner of Patents
Box No Fee/Amendment
Washington, D.C. 20231

From:

24222

24222

PATENT TRADEMARK OFFICE

CERTIFICATE OF FACSIMILE 37 CFR 1.8: I certify that this correspondence is being faxed to: Examiner John J. Guarriello at FAX #: 703-872-9310 Tel. #: 703-308-3209 on the below date.

Date: 10/21/2002
[X] Debra A. Stengel

[] Vernon C. Maine, Reg. No. 37,389 or [] Scott J. Asmus, Reg. No. 42,269

CERTIFICATE OF MAILING 37 CFR 1.8: I certify that this correspondence is being deposited on the below date with the U.S. Postal Service with sufficient postage as FIRST CLASS MAIL addressed to: Assistant Commissioner of Patents, Washington, DC 20231.

Date: [] Vernon C. Maine, Reg. No. 37,389 or [] Scott J. Asmus, Reg. No. 42,269

Dear Assistant Commissioner:

This declaration is offered in support of the above application for patent.

RULE 132 DECLARATION OF CHARLES A. HOWLAND
(37 CFR 1.132)

My name is Charles A. Howland. My qualifications in the field of the invention are as follows. I hold a Bachelor of Science degree in Mechanical Engineering from Massachusetts Institute of Technology. My thesis work focused on extrusion methods for polymer processing. I have spent the last 20 years in industrial research focused on flexible composites and assembly. In addition to the last 11 years as Technical Director of Warwick Mills, I have worked in textile reinforcement of tires, puncture resistant military tires and other advanced truck tire materials at Michelin Americas Research Corp and at assembly systems at Digital Equipment.

During the last 11 years my research group at Warwick has taken a leadership role in a range of difficult fibers based materials problems. These include the Vectran based crash bags for

Applicant's Declaration, page 1

the Pathfinder, Mir and Beagle Mars missions for Jet Propulsion Lab. We have developed most of the Hull, Ballonet and heatseal tape materials for the current generation of Aerostat tethered blimps and the other military and commercial airships. We have patents pending in this field.

Here at Warwick Mills, we are leaders in the development of a new class of puncture resistant materials with applications in Tires, Gloves, Industrial Apparel, and Stab Resistant Vests. We hold pioneering patents in this art and continue to lead the industry in this materials class. We have developed and hold patents in the use of these materials in law enforcement and industrial gloves, and safety suits for protection from ultra high-pressure water.

Objectives of the Invention revisited:

Among the objectives of this and my related inventions, are to provide soft, lightweight materials that deliver very high levels of puncture and cut resistance. In law enforcement, cost is a major factor in the acceptance of armor materials so these materials must be cost effective. The key elements of this new system are the use of staple yarns in a tightly woven structure. This structure allows the low denier staple yarn to be use for stab and puncture Staple yarn is 1/3 to 1/4 the cost of filament yarn of similar denier.

Novelty:

The basis or novel aspects of the claimed invention is: The use of high cover fabrics where the weave density is adequate to prevent lateral shifting of the yarns, in combination with high modulus fiber at least in part of short staple type. This is a radical development in the protective fabrics area of art. In this area the use of filament yarns is more than dominate it is universal in this area of art. These new fabrics are novel for their geometry alone. The use of staple yarn makes them novel on a second basis. The use of dense weave structures makes the staple yarn effective in these demanding applications.

Applicant's Declaration, page 2

Problems with the cited prior art of Dunbar's 5,579,628:

Yarn filaments or fibers are normally twisted together to produce a coherent yarn structure, which facilitates handling and weaving. However, applying excessive twist to the yarn fibers weakens the yarn. In contrast to these general statements, the Dunbar disclosure is about low density, specifically ballistic resistant weave fabrics and how the entanglement of continuous filament yarn can be used to avoid excessive twist for weaving performance, while still offering ballistic performance. Dunbar specifically discloses a balanced, taped out, loosely woven taffeta construction, as illustrated by his examples of 56 x 56 count 215 denier Spectra. As will be readily apparent to those skilled in the art, Dunbar is inherently exclusively confined to continuous filament yarns. He teaches a maximum twist of 2.5 turns per inch, and a preferred 0.5 turns per inch, to avoid the fuller twisted, more round yarn structure and other shortcomings of heavily twisted filament, to obtain the taped out yarn profile described in his specification.

Dunbar's disclosure is distinctly void of consideration of the high density weave fabrics discussed in my disclosure, cited examples of which included 90 x 88 and 130 x 86 weaves using 200 denier warp and 200 denier fill yarns, and 100 x 68, 110 x 67, and 130 x 65 weaves using 200 denier warp and 400 denier fill yarns.

The Dunbar work relates to prior, loose weave, ballistic-only art where a yarn is taped out or has a width greater than its height. This flat taped yarn is made more weavable by the entanglement process that he teaches. It is instructive to view his micrographs showing yarns of his loosely woven fabrics that are spread out to form cross section structures where the width is much greater than the height. The intersections of the woven fabric are remarkably open, as a result of the yarn geometry, suitable for Dunbar's ballistic-only purposes.

All Dunbar constructions allow for maximum width to high for the yarn cross section and fabric he is defining. This is dramatically opposed to my densely woven constructions using staple yarns, intended to provide stab, cut, and ballistic resistance, in which width to height of the yarn

Applicant's Declaration, page 3

cross sections are severely limited and very tight intersections are inherent in the fabric weave because of the yarn weight and high density of the yarn spacing.

In particular, our present claims are patentably distinguished from Dunbar in that all are limited to fabrics with high density weaves of at least 70 ends per inch in at least one direction, and yet further distinguished by using yarns made of staple fibers, which are relatively short yarn fibers or filaments as are fully described in its specification. This densely woven construction of high tenacity staple fibers offers a useful, combination of cut, stab and ballistic protection not achievable in the ballistic-only, relatively loose weave prior art of Dunbar and less costly than using continuous filament yarns of the same material. The staple yarns described and claimed can not even be entangled as described in Dunbar. Nor can staple fiber be processed into yarn without having a twist much greater than about 2.5 turns per inch, the maximum permitted by Dunbar.

There is a threshold of about 70 ends per inch that is well recognized in the industry and referenced in my specification as dividing a different and vastly more difficult weaving domain from the traditional, lower density weaves such as the flat weaves illustrated in the Dunbar specification. The geometry of the warp and fill intersection and the yarn cross section in high density weave fabrics, which are well illustrated in our specification, are remarkably different and more challenging to produce than are weaves of lesser densities as in Dunbar. The likely assumptions that could be from the Dunbar-type low density weaves and yarn entanglement schemes, do not extend to the high density weave and staple yarn arena. The teachings of Dunbar are inapplicable to my claims and if considered as of the time it was issued, do not make our high density staple fiber fabric obvious.

For example, in puncture resistant art, the mobility of the yarns to be displaced laterally in the fabric, or to slide aside under impact of a sharp penetrator, is a vital characteristic that must be controlled. The taffeta construction has ballistic performance because of the relatively large size of the bullet penetrator as compared to the weave density. However taffeta constructions do not even contemplate control of the sliding of yarns, as is readily evident in the inadequate density of spacing of the yarns most noticeable at the intersections of his fabric photos.

Applicant's Declaration, page 4

Dunbar only teaches taffeta constructions. Traditional taffeta design is based on a flat yarn, open weave precept to allow the maximum spread of the yarns used. This gives the softest thinnest fabric for a given weight of fiber. All the Dunbar variations in fiber type, denier, denier per filament, entanglement and weave only pertain to loosely woven fabrics. Dunbar does not apply to tightly woven staple yarn fabrics.

The undersigned declares further that all statements of his own knowledge made herein are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application of any patent issuing thereon.

Respectfully submitted this 10/21/02



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Applicant's Declaration, page 5